MicroCell™ Informational Document for
Technical, Operational, and Troubleshooting Issues v1.7
by Otto Pylot

The AT&T MicroCell is a very useful device when in-home cellular coverage is lacking or non-existent. However, it has developed a love/hate relationship with some customers. The purpose of this document is to hopefully explain some the technical workings of the MicroCell, which may help to explain why some customers have problems with their MicroCell's or their phones when attempting to connect.

There is a new version of the MicroCell, the DPH-154, and is the black model displayed above. It has a smaller footprint, but without the Computer and external antenna ports. Otherwise, as of this writing, the new model functions the same as the older, white model.

The MicroCell is a totally closed system so there is no access to modify or change settings like you can with a router. Only AT&T can modify the system and does so on occasion with updates automatically pushed to the unit (usually in the middle of the night). There are no announcements of what the updates are for or when they will be pushed out.

The MicroCell is primarily for voice. You can use it for data, but the speeds will be slow (typically up to about 3.0Mbps download) even though it uses 3G (HSPA) for throughput. Voice doesn't have the same bandwidth requirements that data does so if your download speeds are terrible (which they probably will be) on the MicroCell, voice should still be fine. That's why the recommendation is to leave WiFi on if you plan to use data as well. That way, data will be downloaded via WiFi and voice will be handled by the MicroCell. You data usage will also not go against your data plan if you use WiFi.

VoIP Basics:

VoIP (Voice over Internet Protocol) is basically converting an analog voice communication to digital communication, which is then transmitted from one point to another by way of the internet. This is not easy and takes a considerable amount of technology and cooperation among the various service providers to get it to work without any issues. Most of the time, we just pick up our phones, make a call, and not even think about what is going on behind the scenes to place that call.

The key factors that affect VoIP are as follows:

Latency - this is the amount of time it takes a voice packet to get from your location to its destination over the internet, and is usually measured in milliseconds (ms). The lower the latency, the better the call. High latency can cause calls to be dropped or affect the overall quality of the call. Causes of high latency can be many. Some may include the number of router hops (increases the danger of voice packets being incorrectly copied and sent thru), network congestion, low bandwidth, buffer management, data communication protocols (routing and switching), etc.

Unfortunately, the end user has no control over these issues and they can be on-going or temporary.

Jitter – this is defined as a variation in the delay of received packets. Data packets are sent as a continuous stream evenly spaced apart. Due to network congestion, improper queing, or configuration issues, the steady stream may be interrupted such that the delay between each packet can vary instead of remaining constant.

When the router receives the RTP (Real-Time Protocol) audio stream, it has to compensate for any jitter that is encountered. This basically means that the RTP has to be buffered and then put back together in a steady stream to be sent to the DSP (Digital Signal Processor) and re-converted back to an analog signal. This buffer is either called the playout delay buffer or the de-jitter buffer.

If the jitter is too large to be buffered adequately, packets are discarded which results in audio dropouts. Sometimes the dropouts are not noticeable if the DSP can insert packets that it thinks should be there (predictive insertion). If they are too large, audio quality deteriorates or the connection is dropped.

Jitter can only be fixed by your ISP.

Packet Loss – this is simply data packets that just get lost in transit. Not an uncommon event on the internet. Causes can include signal degradation, channel congestion, corrupted packets being rejected in-transit, faulty network hardware, faulty network drivers, or home network/wiring issues. Sometimes packet loss can be intentional by your ISP for operational management purposes.

Excessive packet loss can result in voice dropouts or loss of connectivity. Packets are transmitted using either TCP (Transmission Control Protocol) or UDP (User Datagram Protocol) protocols on specific ports designated by AT&T. The exact function of those protocols will not be discussed in this document.

Insufficient Bandwidth – it's nice to have a 50Mbps download speed but that is rarely a sustained speed (100% of the time). It will vary for lots of reasons and are not guaranteed by your ISP (the term usually given is "up to"). Most of the time one is close to that but variations will occur with sometimes very drastic speed fluctuations. All of which can affect the MicroCell voice quality and connectivity.

You home network will also affect the bandwidth if you are sharing multiple devices that can all connect to the internet.

There are various applications that you can use to test for latency, jitter, packet loss, and speed. But these only take snapshots at that point in time. To get a more

accurate determination on what is going on with your network, these determinations need to be made over longer periods of time and compared to the times of day to ascertain high usage windows which may coincide with issues. The following links are for two good tests you can perform to assess your line quality. Keep in mind that these are only "snapshots" for the time in which you run the tests but it may give you some useful information. To assess your true line quality you would need your ISP to perform these, or similar tests over a longer period of time:

http://www.speedtest.net/

http://www.voipqualitytest.com/

Requirements:

3G, 4G, or LTE-capable AT&T equipment.

An AT&T SIM card.

Registered for myAT&T account. **NOTE:** if you are unable to register (registration info saved) or add phone numbers, it may be the browser version you are using. Try a different browser. For example, if using FireFox doesn't work, try Safari (if on a Mac), or if IE doesn't work, try Chrome.

Internet service. The MicroCell can work with any ISP, **EXCEPT SATELLITE and possibly wireless broadband due to latency issues**. Minimum download and upload speeds are 1.5Mbps and 256Kbps respectively. However, I think it really should be 3.0Mbps and 512Kbps (personal observation). A stable internet connection is essential.

The MicroCell must reside within an AT&T MicroCell coverage area:
1. The location has to be within an area AT&T is licensed to have coverage.
2. The network (for call routing) in the area has to be configured properly for the MicroCell.
3. All E911 services within the AT&T network have to be configured for MicroCell use.

Active postpaid account.

Prepaid customers can be approved users on an active postpaid customer's approval list, but cannot own the AT&T MicroCell device. In other words, the primary phone number has to be a postpaid account.

The MicroCell can support up to four voice or data users at once and can be shared with up to 15 UMTS mobile phones (but they must all be on the AT&T service).

There is no monthly cost to use the MicroCell unless you choose to opt for the unlimited in-home use plan. Pricing and rebates may vary from time to time.

You can have multiple MicroCells on one account at a single location to extend coverage.

Nominal setup: modem -> router -> MicroCell.

The MicroCell needs to be no more than 18" away from a window with an unobstructed view of the sky and at least 2' away from a WiFi source. The MicroCell can be oriented in such a way that the side of the MicroCell is horizontal to the window if you are having trouble getting a good GPS lock. In other words, if you are looking at the lights on the front of the MicroCell, the right or left side is facing the window. The reason is that the antennas are located on the top of the pc board and sometimes a 90 degree orientation is enough to render GPS fixing variable. GPS connectivity must be maintained at all times.

If you need to use a GPS extension antenna to locate the MicroCell away from a window they can be found online. The connector is a MCX type. One adapter that is available is from L-Com (Part#CA-MPNFCN19) and allows one to connect a 70 Ft type high quality "N" cable to an external GPS antenna, but others that are not so expensive are available from Amazon and you can even find one specific for the MicroCell.

Alternate setup: modem -> MicroCell -> router.

This is usually reserved for troubleshooting because it by-passes the router altogether which eliminates one source of connection issues. You can use the connection if it solves your problem without any harm, but the MicroCell will have a direct connection to the internet and this configuration may adversely affect other connected network devices, especially their bandwidth.

Minimum Router requirements:
    DHCP enabled
    Ports 123 UDP, 443 TCP, 500 UDP, and 4500 UDP must be open (Public and Private ports).
    IPSec Pass-Through is enabled
    Block Fragmented Packets is disabled
    NAT duties handled by only one device if you have a separate router and modem (gateway)

OpenBSD 4.9 router notes: for those of you who use OpenBSD, some issues have been reported when using the 192.168.100.0/24 subnet. You may want to try 192.168.1.0/24 and see if that corrects the problem.

U-Verse Basics:

AT&T's High Speed Internet Access (HSIA) service is either ADSL2+, which uses your existing copper-based lines, or VDSL, which is a combination of fiber and copper, to bring HSI to your premises. The use of either technology is dependent ,in part, on what is already in your existing neighborhood or what AT&T (or another provider) has upgraded the neighborhood to.

VDSL is distance limited like DSL, but uses a fiber optic connection part of the way to increase speed and bandwidth. The final connection to the premises (last mile) can, and usually is, over the existing copper lines.

FTTN - Fiber To The Node (or Neighborhood), FTTP - Fiber To The Pole (or Premises), FTTC - Fiber To The Curb, or FTTH - Fiber To The Home, are all methods of delivering VDSL to the home, and all depend on some sort of neighborhood box called a VRAD (Video Ready Access Device). However, the VRAD is more of a rack of cards that provide connection to the home than it is a "device". The cards could be for fiber connection or different versions of VDSL2 connection cards.

Running fiber from the CO (Central Office) to the VRAD isn't cheap, and neither are the VRAD's, so that's why some neighborhoods don't have VDSL service because it all depends on what kind of ROI (Return On Investment) your particular service provider expects and if deployment is cost effective.

Either type of service works well with the MicroCell. But VDSL is a bit more tempermental and less tolerant of line faults like bridge taps and AM interference, and thus is a bit more difficult to get installed correctly for the MicroCell.

The RG (Residential Gateway) chosen is dependent upon the type of VDSL that you have and the distance from the VRAD. A bonded pair connection is used if your premises is between 3000' and 5500' from the VRAD (that's cable length) or a single bonded pair is used if you are 0 – 3000' from the VRAD. The distance determination is totally up to the discretion of AT&T.

ADSL2+ modems won't work with VDSL2 connections and vice versa.

As of this writing, the RG's installed for U-verse services are:

Motorola NVG 510 for ADSL2+ - the newest offered but can have problem with marginal lines and has had DNS issues.

Motorola NVG 589 – VDSL2 for those who have a bonded pair.

PACE 5031 - are supposed to the "best" for VDSL without a bonded pair (they can also be used for ADSL2+ but are not recommended).

2Wire 3801 – VDSL2 of choice for customers between 1900 and 3000'.

2Wire 3800 – VDSL2 for shorter distances than the 3801. The 3801 and the 3800 are pretty much interchangeable but the 3801 does better with weaker signals.

Pace 4111n – currently is only certified for ADSL and not ADSL2+, but there may be a new firmware upgrade that will give it dual mode capability in the future.

RG's are constantly evolving with firmware/software upgrades so the above is just to give you an idea of what is involved in getting the MicroCell to work well with U-verse.

Wireless Home Phone (WHP):

The Wireless Home Phone (WHP) is a standalone device that allows the user to use a traditional corded/cordless handset to make calls. It uses the AT&T Mobility Wireless Network which is the cellular GSM network (850/1900MHz). If you have decent cellular coverage in your home, then the WHP will connect to the closest tower. If not, you can use a MicroCell to make that connection.

It may help to think of the WHP as a cell phone. It is activated with a SIM card, is considered Mobility service, and appears as just another line on a customer's Mobility bill. It is not billed as a "wired/landline" product. In addition to a standalone plan, WHP can be added to Mobile Share or grandfathered Family Talk plans. Since WHP has no data or messaging capabilities, it won't impact the data usage for these types of "shared data" plans. The WHP is not a VoIP device.

The current model of WHP is the WF720. There is a new WHPI model (Z700) that is being offered in specific markets as a pilot. The new model has not been tested with the MicroCell because it is intended for the customer base that cannot use a MicroCell. It will include data and will work similarly to a Mi-Fi device in that it will provide the customer with their home internet. Because it would replace the customer's home internet, they would not have broadband that would be compatible with the MicroCell. The MicroCell is not compatible with wireless broadband.

The WHP is a closed device like the MicroCell so there are no configuration options

available. Without the use of the MicroCell, the Signal Strength LED will be solid green, yellow, or red to indicate the quality of the signal. When connected to the MicroCell, the Signal Strength LED will blink green. To connect to the MicroCell, the WHP needs to have its phone number added to the Approved User List of the MicroCell. The WHP has no keypad, touchscreen, or any other means of dialing a phone number or placing/receiving calls. It needs to have a corded/cordless phone plugged into it instead of having the phone plugged into a traditional phone wall outlet.

WHP call quality can be affected by the same factors that affect the MicroCell call quality when the WHP is using the MicroCell to make its GSM connection.

Ethernet Conditions:

The MicroCell needs to be physically connected via an ethernet cable to the router or gateway at all times. PowerLine Adapters can be used but they may not work because house-wiring conditions can be variable due to age, installation, etc. Newer homes and condos may have pre-wired RJ-45 or 8P8C connectors in-wall. These should work but proper installation, which would be continuous length of wire (no intermittent adapters), type of wire used (twisted vs solid core), degree of wire bending, wall board nails touching the wire, and proper wiring to the connectors will all affect performance. The MicroCell apparently is more sensitive to grounding and voltage fluctuations than a router is so any variation may cause the MicroCell to lose connection and the only way to re-establish connectivity is to restart the MicroCell and/or the phone. If you are using a wireless router and want to locate your MicroCell in a different location in your home that prohibits hard-wiring it to your router, you may be able to use a wireless repeater next to the Microcell and hard-wire the Microcell to the repeater.

The MicroCell does generate some heat at the top so give it plenty of ventilation and try not to put it in direct sunlight when placing it next to a window.

The MicroCell can be used at locations other than your home (summer house for example) as long as the primary account phone number is the same and you change the address of the setup page to reflect the current physical location of the MicroCell (for GPS confirmation and initialization).

GPS Lock:

The MicroCell needs to <u>maintain a GPS lock at all times</u>. This is for E911 services and for timing purposes to allow the data packets to synchronize between the MicroCell and the nearest tower for handing off calls. The MicroCell does not have a very good atomic clock embedded so it needs to do this for timing the packets.

AT&T performs maintenance on their network usually on a nightly basis during the

hours of minimal usage, usually very late at night or early in the morning. GPS location is verified by using the local tower and the NWL (Network Listen) protocol. If NWL fails for any reason, then the MicroCell uses the standard GPS scan to confirm location. If that fails, connection is lost until it can be re-established by either re-booting or calling support if the reboot or deactivating/reactivating doesn't work.

GPS also allows the MicroCell to choose which frequencies are licensed by AT&T that can be legally used in the area. Since the unit operates on the same frequencies as used by the towers, it must operate within the licenses owned by AT&T but these licenses can vary from region to region.

GPS signals are broadcast on a 1.5GHz channel which can be absorbed by wood and metal. So moving the unit a couple of feet to either side of a window may make a difference in GPS lock. An external antenna can be used if optimal window location is not possible. The external antenna input on the back of the MicroCell uses an MCX type connection. Good antennas can be found on Amazon with the prices varying from inexpensive to fairly expensive.

Speaking of E911 calls, any E911 call from a mobile device should be done with the complete 10-digit phone number, not just 911. The reason for this is call delay. On a landline, the 911 operator has your exact GPS coordinates instantly, and even if you can't speak, but leave the connection open, they can roll emergency vehicles to you immediately. Mobile devices and VoIP calls (**the MicroCell is a VoIP device**) are usually routed first thru your local Highway Patrol or State Trooper's 911 dispatcher, and then that's routed to the local 911 operator. That's usually very quick but there can still be somewhat of a delay. The landline (voice) dispatcher has instant access to the GPS database for all calls, and mobile calls may not have the instant access like the landline operators do. Dialing the 10-digit number is the same as using a landline. This is getting better as more calls move away from landline and go to mobile but it is something to consider for use in-home. The downside is that the 10-digit number is based on your area code and if you are out of your area code you have no choice but to dial 911.

Initial Activation:

When the MicroCell first boots up, the unit gets a DHCP license, syncs with network time over NTP, and then does a DNS query for xxxxx.wireless.att.com. Once successful, it talks to that server over HTTPS (TLSv1) for a while and then immediately starts an IPsec VPN with xx.xxx.xxx.193.

From AT&T: *The address where the MicroCell is physically located will be verified via the online registration process prior to use. If buildings, landforms, or other obstructions block satellite and/or cell tower wireless signals to the MicroCell, AT&T may be unable to verify the location of the device. If AT&T is unable to verify that the physical address of the device is located within an AT&T authorized service area, the MicroCell will not remain in service.*

Once that is established, the MicroCell gets the GPS signal, confirms that with NWL, notes the local tower signal, and adjusts its internal transmitter power. At the same time it is updating any firmware changes it needs to do (that's why you may see it reboot a couple of times or take a bit longer to complete the activation process), building a handoff list of macrocells (towers) that are in range, and collecting information about which frequencies are active in proximity. The greater the received signal strength from the local tower, the lower the 3G transmitter power from the MicroCell to your phone. The reason for this is so the MicroCell won't interfere with the local tower signal. That's why if you are really far away from a local tower, your MicroCell's transmission power will be increased with the resulting better reception on your mobile phone. However, the closer the tower(s) are, the opposite effect happens. **NOTE: The MicroCell does not <u>need</u> a local tower to activate, only GPS lock**.

To complicate matters, the <u>individual mobile phones also adjust their transmission strength in relationship to what it receives from the MicroCell</u>, and some phones are just better at this than others, hence the variability between phones when connecting, and staying connected to the MicroCell. For some phones, increased battery drain may be experienced because of this.

Changing the location of the MicroCell in your house may alleviate any tower issues if you are in a particularly strong, or weak, area. Try to find the "sweet spot" if you can. This may work for some if you are having issues related to tower strength.

Continuously re-starting the MicroCell (power cycling) repeats the activation process detailed above, which shouldn't change anything if you haven't moved the MicroCell to a different location, but that's no guarantee that transmission power of the MicroCell and/or mobile phone will stay the same.

The MicroCell operates at 850 or 1900 MHz 3G depending on the FCC licenses that AT&T has available at your GPS coordinates.

Handing over:

There are basically two types of handover that happens on cellular networks, soft and hard handovers.

In soft handovers, the phone is continually talking to multiple macrocells (towers) at the same time, so the transition is seamless because you are already connected and communicating with the towers you are going to be handed over to.

In hard handovers, the phone will literally drop the active connection and transition to another connection. The handover can be further complicated if it is a vertical handover, which happens between network technologies. That is, from UMTS (3G) to GSM (2G), 4G to LTE, and vice versa.

Virtually all femtocells are hard, vertical handovers. That's why a local tower is necessary so that the MicroCell can build a list of the local towers, hopefully both 3G and 2G, and pass that on to the phone in the form of a neighbor list.

So, when you leave your house and are on a call, a hard handover (probably vertical) takes place and if your tower is close, the call doesn't get dropped (in theory). The opposite is true as well. However, if the tower closest to you is far away, handing over is going to be very difficult.

This is one of the most frustrating aspects of the MicroCell (and femtocells in general). If your local tower is far away, you'll probably get excellent coverage in-home, but handing over when you leave your house will be problematic. On the other hand, if you have a tower or towers close by, handing off will be great but in-home coverage or handing off to the MicroCell may suffer due to MicroCell transmission strength.

Technical Information:

The 3G labeled MicroCell uses a 400MHz ARM11 processor. The newer MicroCell's (DPH-154, black model) processor is not confirmed at this point in time.

Range is about 5000 square feet. But that is dependent in part, on how close or how far away you are from a tower. Generally speaking, if a tower is within 2 miles of your home, coverage should be ok.

UMTS (Universal Mobile Telecommunications System), which is also called WCMDA, is the most widely used 3G standard for mobile phones and is carried on a 5MHz carrier signal. UMTS data is limited to 384 Kbps but data throughput and speed is increased by enabling HSPA+ (which AT&T calls 4G). Some iPhones may indicate 4G when connected to a MicroCell (M-Cell displayed) but that is just indicating that the iPhone is detecting the 3G with HSPA+ enabled.

LTE is operated on the AT&T network at 700 MHz. The MicroCell only operates at 850 and 1900 MHz.

AT&Ts 3G offers data up to 3.6Mbps alongside voice which is pretty much what I saw with my iPhone 5 SpeedTest when I tested it in 2013..

HD Voice, while it doesn't pertain to the MicroCell specifically, does come up from time to time in the forums so I thought I'd briefly mention it here. HD Voice, which AT&T will call VoLTE, is basically wideband technology using the frequency range that is more compatible to human hearing, which is 80Hz – 7KHz at about 16,000 audio sample per second. Current mobile phone technology uses a frequency range of about 300Hz – 3.4KHz at 8,000 audio samples per second. In theory, 3G (HSPA+) can handle HD Voice but AT&T will in all likelihood carry it on LTE 700MHz frequency. The MicroCell only uses the 850 and 1900MHz frequencies.

One of the downsides of HD Voice, at least in initial testing, is that it can really deplete your battery rather quickly. Hopefully that will be resolved as it begins to roll out. The current 3G technology is imbedded on the base band chipset in the MicroCell so upgrading the 3G labeled MicroCell's to 4G/LTE is not possible without a hardware upgrade.

The a/c adapter is model no. 3A-153WU12 (for my white, DPH-131). The power requirements for the MicroCell are fairly specific and an adapter that is starting to go out can cause all kinds of problems, mostly lost connection to the AT&T servers.
Input: 100-120V, 50-60Hz, 0.4A

Output: 12V, 1.25A, positive polarity   ⊖—◉—⊕

The newest MicroCell, DPH-154 (black model) is slightly different:
It's a switching adapter, model no. DSA-12PFA-09.
Input: 100-240V, 0.5
Output: 12V, 1A, positive polarity, Level 3, Efficiency Level V

IMSI (International Mobile Subscriber Identity) Number:
Your phone will send an IMSI number to the current network while registering which allows the network hardware to recognize the subscriber (phone). This number is sent as rarely as possible to prevent interception and is sometimes sent as a TMSI, which is a temporarily generated code for the mobile subscriber identity. The number is on the SIM card (for phones that use them) and is used by any mobile network that can interconnect with other networks. CDMA networks (Verizon for example) have their IMSI codes embedded.

AT&T only supports 310410 (310 = USA and 410 = AT&T). The number is stored as a 64-bit field and is converted to a 15-digit number based on MCC (Mobile Country Code), MNC (Mobile Network Code), and MSIN (Mobile Station Identity Number). So, the MCC is 310 and the MNC is 410, etc. for AT&T.

The IMSI number is converted by AT&T's IT Department to a phone number. But AT&T doesn't have a list of all of the possible IMSI numbers worldwide because that would be very expensive to maintain. The MicroCell is an IMSI based system which is how it ties into the AT&T network and forces conversion to actual numbers.

What that all means is that if you buy a non-AT&T branded phone, a jail broke phone, or one that is not currently being sold domestically, it <u>may not work</u> with the MicroCell because the IMSI number is not recognized.

IMEI (International Mobile Equipment Identity) Number:
This is not to be confused with the IMSI number. It is a 15-digit number that is unique for each device. The IMEI number is provided by the carrier when you sign up for service. It is the phone's registration number and is also used for tracking phones or blocking stolen phones. The question has come up before, "if I have an AT&T provided IMEI number, why doesn't my phone connect to the MicroCell"? The answer may be the IMSI number.

Connection Issues

This can be a very difficult and frustrating area because a single issue may be caused by different factors so there is not always an exact cause and effect when attempting to resolve a problem. Common "fixes" may resolve different issues. Hopefully the above technical and operational explanations will shed some light on why there are issues for some people and how difficult it can be to identify and correct them.

First of all, the MicroCell is a totally closed system, physically and firmware-wise. There is no way to access the firmware to modify the system to error check like there is for a router. Physically, the MicroCell has anti-tamper clips on the inside and once you open the unit, the clips disengage and unless you can get them back in the exact same place when re-assembling the unit, the MicroCell will be rendered useless. There are instructions online that show how to open and successfully close the MicroCell but there is absolutely nothing inside that is going to be of any use to the user and/or support. There is an LED light pattern on the pc board but the meaning of the blinking sequence is meaningless to all except maybe an engineer.

If the MicroCell gets knocked over (the cat ran into it) and you notice a slight rattle inside when you pick it up, the anti-tamper clips may have come loose and the unit may be damaged and not work correctly.

All of the suggested troubleshooting techniques are assuming that the MicroCell is setup properly and did work at one time. The suggestions work for most, but not all of the time. Because of the wide variety in home LAN setups, equipment, macrocell

(tower) locations, etc. some issues may be more difficult to resolve than others.

MicroCell Service Area Outages:

The causes for this are many and varied and are beyond the scope of this document
so I won't go into that here. An outage can be localized or regional depending on the
cause and can be fixed quickly or go on for a week or more. More serious outages
can have a cascading affect and reach across different MicroCell Service Areas over a
period of time. Support is usually the last to know about the outages so when you
experience a sudden loss of connectivity for no apparent reason, and can't correct it
with any of the troubleshooting procedures found here, it's best to PM
CustomerCare with your issue, what you have done to correct it, your account
information, and most importantly, your location. Individual connectivity loss can
happen at any time, but if Support starts to see a pattern with the same issues
reported from different locations, the Network Engineers should be notified and
with the location info, it may help them to isolate and correct the problem quicker.
The outage may also affect other services such as the myATT account page so that
attempting to deactivate/reactivate your account, or modify your account in any
way may not work.

Once the outage is isolated and corrected, not all MicroCell Service Areas will come
back online at the same time because it will take time for the fix to propagate thru
the system, and there may still be localized areas that will take a little more work to
identify and correct. You may have to perform a **Complete Reset/Activation** for
your MicroCell if simple power cycling or any of the other procedures listed under
Blinking Green 3G Light do not work.

Blinking Red 3G Light:

This may indicate a hardware failure but more times than not, it is related to an
update that AT&T pushed, and for some reason when the MicroCell re-booted
something got hung up and the unit thinks there is a hardware failure. Power
cycling the MicroCell can clear the ROM. If that doesn't work, a hard reset may be
necessary. There is a small reset hole on the back of the MicroCell towards the top.
Power off the MicroCell. Use a paperclip and push the button in and hold for 30
seconds while the MicroCell is powered on. The MicroCell will go thru the re-
start/activation process and that should clear what ever got hung up initially. The
initialization process may take longer than you expect for the reasons mentioned
under the Initial Activation section because of the update. Updates are not always
system-wide and may be regional. You still may be able to use the MicroCell with the
3G light blinking red but it is telling you that a problem is present.

Power Light is Red or Not Lit:

Obviously a power problem, especially if none of the lights are on. Check the power cable to make sure it is firmly in place and the same at the outlet. Check the outlet with a circuit tester or a lamp to make sure it is ok. If the a/c adapter feels warmer than it should (subjective I know but if it's too hot to touch….) you may want to replace it with an ac adapter that has minimally the same specs as listed above.

Check the outlet itself or try another outlet to see if that works.

If the Power Light is red, that could mean that the MicroCell's power supply has failed and the unit will probably have to be replaced.

Ethernet Light is Blinking:

No ethernet connection or connection is bad. Check the ethernet cable to make sure it is firmly in place at both ends, is not severely bent, or frayed anywhere (the cat chewed on it). Check your cable or DSL line connection. If all of your other devices can connect with no issues to the internet, then it is something specific to the MicroCell.

Power cycle the MicroCell and/or the router to see if connectivity re-establishes.

Perform a hard reset on the MicroCell by disconnecting the power to the MicroCell and then holding in the reset button on the back for about 30 seconds while restoring power.

If you have a separate router, do a priority connection (as discussed previously) to the gateway and see if that works. If it does, then it may be an issue with one of the router ethernet ports. Try a different port.

Check with your ISP and make sure that they aren't blocking any of the ports listed above. I have seen cases where an upstream switch was faulty, even though the connection to the ISP was fine, and only after diligent digging around by the ISP was the switch corrected. AT&T has very little control at times on connection to their network so that's why they list which ports need to be open all the way to their servers.

GPS Light Blinking:

Make sure that the Power and Internet lights are solid green. Otherwise, try to resolve those issues first.

Orient the MicroCell as suggested under Nominal Setup. I have mine placed on a

small stand so that the top of the MicroCell is about two or three inches below the window sill. This gives the top of the MicroCell maximum exposure to my North facing window. We have a metal roof and have no GPS issues at all with this placement.

If you live in a rural area or a relatively new area, AT&T may not have your address in their locational database that matches your GPS coordinates. If you can't get GPS lock, then E911 can't be confirmed or tower location for handing off, and activation won't take place.

Make sure your address is correct on the Activation page, which is found on your myAT&T account. AT&T may have to update their database or make some changes to your account at their end and that will require a call to phone support or a PM to CustomerCare.

https://www.att.com/olam/passthroughAction.myworld?actionType=Manage

Blinking Green 3G light:

This is one of the most common issues, of which there are many causes. Basically, you have no connection to the AT&T servers or Activation is still pending.

If Power, Internet, and GPS lights are solid green, and you've tried the individual steps such as power cycling (MicroCell, router, etc), de-registering/re-registering, hard reset etc., try the following steps in order to perform a **Complete Reset/Activation** and see if that corrects the issue:

1. Turn off your phone
2. De-register the MicroCell on myATT and log off
3. Perform a hard reset of the MicroCell. Disconnect the power to the MicroCell. Hold in the reset button and re-establish power and keep the reset button held in for about 30 seconds
4. Re-register the MicroCell on myATT
5. Wait till the registration and updates (if any) finish
6. Turn on the phone

What you are doing is setting the MicroCell back to its default settings so that it, and the phone, has to go thru the entire Initial Activation process. This may be particularly useful if there has been a MicroCell Service Area outage and a simple power cycle doesn't re-establish a stable connection, or an update was pushed to correct a phone-specific issue.

Setup an alternate connection if you have a separate router/gateway. If that works, then it's probably a configuration issue with your router. Make sure your router's

firmware is current or that any changes haven't been made (automatic updates). If the above suggestions don't work, then you may have to look at your router settings. The minimum requirements are listed at the beginning of this document. If you don't know how to check the listed parameters, you'll have to contact your ISP or the router's mfr. AT&T support probably won't be able help you much because there are just too many different routers and router/gateway combos available for them to keep current on. Besides, it's technically not their responsibility for the operation of your equipment to make sure it adheres to the basic requirements needed for proper operation of the MicroCell.

I have my router set for port forwarding to a static IP address based on the MicroCell's MAC address, using the ports listed above, which has resulted in rock solid performance for my MicroCell even with planned and un-planned power outages. In theory, port forwarding shouldn't be necessary but it does make for a more reliable connection especially if you have power outage issues.

If you purchased a second-hand MicroCell (eBay for example) the MicroCell has to be deactivated by the original account holder or you won't be able to register it and activate your account. The reason for this is because the serial number of the MicroCell is tied to the current account holder's information. If that's the case, AT&T support can deactivate the account, but that can take time, probably because they have to make sure that it's a legitimately purchased second-hand MicroCell before deactivating the account.

Phone Not Connecting to the MicroCell:

The causes for this can vary but if the MicroCell looks operational (Power, Internet, GPS, and 3G lights are solid green), then it's probably the phone.

Add an AT&T phone to the Guest List and see if it can connect to rule out your phone.

For the iPhone, Reset Network Settings and see if that works or whatever the equivalent is for other phones.

Call Support because they can sometimes tweak account settings on their end that improves connectivity.

Non-connectivity could be an IMSI issue (see IMSI Number). There is very little that can be done if that's the case.

See transmission strength under Initial Activation.

Turning Airplane mode off and then on sometimes re-establishes connectivity but

this is only a temporary "fix".

Dropped Calls and/or Call Quality:

The main cause seems to be variable internet speed. The faster, and more stable your speeds are, the better the call, connectivity and quality-wise.

Latency, packet loss, etc will affect your calls. RTP jitter can also be a problem with VoIP calls using the MicroCell. RTP (Real Time Protocol) is defined as the variation in the delay of received packets and can be caused by network congestion, improper queuing, or configuration issues.

Another cause may be that the tower signal is stronger than the MicroCell signal (see Handing Over and Initial Activation above). Disabling call handout on your MicroCell Settings page (under your myAT&T account) may help
Apparently you can call Support and the agent will open a ticket to have the tower signal compared to the MicroCell signal. I don't know how useful this would be because I doubt if Support can properly interpret the numbers unless they are glaringly different, and there is nothing that can be done with tower signal strength.

Keep in mind that a stucco house can act as a Faraday cage and interfere with your calls. Terrain, weather, buildings, building construction, foliage, and **tower aim** can all play a role in increasing or decreasing tower signal strength.

Turning off LTE (on an iPhone 5 for example) may improve the signal if the phone sporadically detects LTE and tries to connect to it.

Leave WiFi on your phone turned on. That way, data is handled by your router's WiFi and voice is left to the MicroCell.

Vonage:

If you have the Vonage VoIP service you may encounter MicroCell problems with the use of the Vonage v-Adapter.

Vonage uses the SIP ALG protocols (Session Initiating Protocol Application Layer Gateway) which is used to try and avoid configuring static NAT on a router. Many routers today come with this feature enabled by default. While ALG could help in solving NAT related problems, the fact is that many router's ALG implementations are wrong and break SIP.

SIP ALG will not cause problems with the MicroCell as the MicroCell does not use SIP protocols. However, in many cases, the SIP ALG is implemented poorly and can

cause other issues. If you can make your MicroCell work with SIP ALG turned off, then it's an indication that SIP ALG is implemented poorly causing MicroCell traffic disruption even though, in theory it should not.

Miscellaneous:

Sometimes the MicroCell just doesn't work because of the multitude of variables. It is also possible that the MicroCell is a lemon and needs to be replaced. If that's the case, then you will have to contact Support and go thru a series of troubleshooting steps before they can determine that it needs to be replaced. All of those steps have been detailed above so you'll be repeating what you've already done, but Support has to document that THEY went thru those steps with you.

Be polite, and patient with Support. They are limited in what they can do and I think their support is limited at times as well. Be as clear and concise as possible in describing your problem, what you have done to fix it, and explain your setup as clearly as you can. Sending a PM to ATTCustomerCare, with your detailed issues, account information, and location is sometimes more efficient than phone Support.

For a brief period of time, the MicroCell was given away for free. This was more for marketing purposes than anything else but some folks who had documented coverage issues got them free as well. That program is over now but you may be able to get a replacement (if it is out of the Warranty Replacement period) for a reduced cost. That is totally up to the support person you talk to so be nice. Some corporate store managers have even been known to go above and beyond and replace them for free (or reduced cost) but that is totally up to the manager and certainly not company policy. However, there are still customers who receive free MicroCell's from time to time so it can't hurt to ask.

Some phones, specifically the Nokia Lumia's have had some major connection issues when other phones worked fine with the same MicroCell. AT&T tested the 900 and 920 (along with another yet-to-be-released model) and couldn't duplicate the problem. That doesn't mean the problem isn't real, I think it just points to some Nokia models having transmission strength/locking issues due to a hardware or firmware problem. Difficult to prove either way.

Newer phones like the Galaxy Note 3 have shown connection issues as well. This may be due to software or features that are not yet compatible with the MicroCell and only the phone manufacturer working with AT&T can fix that. As mobile devices become more and more sophisticated it's likely that phone-specific issues will become more commonplace. Both examples mentioned above may be corrected by performing the Complete Reset/Activation procedure once an update is pushed.

If you have issues with your MicroCell, whether it is brand new or a working MicroCell recently developing problems, don't always assume it's AT&T or the MicroCell. As service providers merge, expand their service areas, install new hardware or security protocols that may, and will, affect the MicroCell for the reasons given above (see VoIP Basics). There is very little, if anything at all, that AT&T can do if your ISP has made changes to their network. We have been fairly successful in bringing issues to the attention of some of the providers who have worked to correct the issues generated on their end but that can take time. Always bring your issues to the forum first because we can help in a lot of instances to restore service but if it is determined to be your provider, then you need to bring that to their attention as well.

With the demise of net neutrality as it was originally envisioned, some service providers have been limiting, and in some cases eliminating altogether, competing services if your ISP offers the same type of service. In other words, if you have AT&T cellular, but your ISP is Verizon, Verizon may prevent the MicroCell from using its internet to gain access to AT&T's servers.

Error Codes

FTC5284 - the system is probably stuck trying to process an earlier request and won't proceed until the error is corrected.

FTC223 – the customer has acquired GPS lock, but location check failure (Tolerance Failure) has occurred because the physical street address entered during online registration does not match the GPS information provided by the MicroCell. The MicroCell address does not match the current device location.

You should contact CustomerCare if you get either of those error codes, or a different one, and notify them of the error code.

MicroCell Alternatives

There are instances when the MicroCell just won't work in your environment as stated above. In that case, you may need to use a cellphone signal booster. The two most common ones are as follows:

Cel-Fi (www.cel-fi.com). These are very expensive ($500 - $600) but are plug and play as long as you have one bar of signal strength in your home. They are the only ones authorized and approved by AT&T as of this writing and are supposed to cover up to 13,000 square feet under ideal conditions.

Wilson Electronics (www.wilsonelectronics.com). These are not as expensive as Cel-Fi and have a number of models to choose from. They do take a little more time and

effort to setup.

To summarize the troubleshooting steps:

Perform a Complete Reset/Activation

Power cycle the MicroCell

Power cycle the router/modem
Deactivate/reactivate your account

Turn your phone off and then on to re-establish connectivity

Hard reset the MicroCell
Check cables for condition and snugness of fit

Check orientation of the MicroCell

Use an external GPS antenna if necessary

Reset network settings on your phone or have support check your network settings

Enable WiFi, disable LTE on your phone

Disable Handout for your MicroCell via the settings page

Toggle Airplane mode on and off (lame)

Check stability of your internet speeds and make sure you have sufficient speed

Check that all of the necessary ports are open all the way to the AT&T servers

Port forward the MicroCell to a static assigned IP address based on the MAC address
of the MicroCell, or place the MicroCell in the DMZ like you would a gaming device

Try different locations in your house to find the "sweet spot"

Keep the number of devices between the MicroCell and AT&T to an absolute
minimum

Adequate ventilation around the MicroCell

Condition of the ac adapter

Connect the MicroCell directly to your router or router/gateway combo with an ethernet cable. If you are using PowerLine Adapters, bypass them if possible and see if that improves your connection

Disclaimer:

This has been a very long project and is still a work in progress. I have tried to make this as accurate as possible. As more accurate information, corrections, or fixes become available, I will update the document. You can PM me for any corrections or future additions to this "living" document.

I am not an AT&T employee. However, this document would not have been possible without the considerable help and guidance from the AT&T Admins and the MicroCell Forum members. I would also like to extend a special thanks to Avedis53 for his help and support.

Otto Pylot
August 2013

Additions/Changes:

Version 1.7, October 2014
1. Added the new DPH-154 graphic
2. Briefly discussed the DPH-154 in the introduction
3. Listed the power adapter specs for the DPH-154
4. Listed common error codes (under Miscellaneous)
5. Listed MicroCell alternatives (under Miscellaneous)

Version 1.6, June 2014
1. Added the voip and speed test links (under VoIP basics)
2. Added the comment about multiple MicroCells at one location (under Requirements)
3. Change the wording of priority setup to alternate setup
4. Added page numbers to the Title of Contents page

Version 1.5, March 2014
1. Added a TOC with the MicroCell graphic
2. Added Wireless Home Phone as it relates to the MicroCell
3. Slight changes to the U-verse section
4. Added Vonage section
5. Added a comment about wireless broadband
6. Added a comment to the Miscellaneous section about competing services

Version 1.4, February 2014

1. MicroCell data speeds
2. U-verse Basics
3. VoIP Basics
4. Added a final comment to the Miscellaneous Musings section
5. Added a separate Ethernet conditions section

Version 1.3, October 2013

1. OpenBSD 4.9 settings
2. Using an alternate browser for Activation
3. Galaxy Note 3
4. Contacting ATTCustomerCare
5. Complete Reset/Activation procedure
6. MicroCell Service Area Outages

Version 1.2, August 2013

1. First release